which are, or should be, employed in determining the quality both of the raw materials and of the finished product. This portion of the book will be very useful to chemists engaged in Portland cement factories, and to every analyst who may have to deal with the problem of determining whether or not a given sample of cement is up to the standard of some particular specification. The different methods employed are explained with great clearness, and the apparatus necessary is shown in well-drawn illustrations; so explicit are the instructions that an engineer who has had a fair training in the elements of chemical analysis could, should necessity arise, make many of these determinations for himself after procuring the necessary apparatus.

The last section of the book is devoted to the physical testing of Portland cement, and this section will be invaluable for reference purposes to the civil engineer and to other users of Portland cement. The author describes in turn all the ordinary physical tests, and his comments upon the various tests and their value in enabling a conclusion to be drawn as to the quality of any given sample are of much practical value.

(2) The first edition of this work appeared in the autumn of 1904, and since that date there has been such great progress in the employment, and in our knowledge, of reinforced concrete that a new edition was rendered imperatively necessary; much new matter has been added in addition to a general revision of all the portions of the book dealing with calculations. Reinforced concrete is still not used in this country to anything like the extent to which it has been employed both in America and on the continent of Europe, but much of the opposition to its use is now steadily declining.

The first three parts of the book are devoted to a general description, with excellent illustrations, of the various systems which have been employed up to the present date, and give a brief account of the materials, including both concrete and the reinforcing metal. Great stress is laid on the absolute necessity of employing only the best material in connection with the concrete, and of ensuring that the materials shall be of uniform quality and the concrete well and carefully made.

Part iv. deals with the practical construction of reinforced concrete for various purposes, and the construction of the necessary moulds for beams, floors, arched ribs, chimney shafts, pipes, sewers, and reservoirs. The next two sections are devoted to a very full and complete account of the experimental researches, and the data deduced therefrom, which form the basis of all calculations necessary in designing reinforced concrete; the authors are to be congratulated on the admirable way in which they have brought together, in a most convenient form for reference, information scattered through a very large number of publications, and on the complete way in which they have brought up to date all the data obtained in experimental investigations. The chapter devoted to calculations necessary in design work has been almost entirely re-written and very considerably simplified, with great advantage to the designer who may desire to consult this work, the method of treatment adopted for the case of singly reinforced rectangular and T beams being entirely new.

The last section of the book, as in the earlier editions, is devoted to a descriptive account of various buildings and structures which have been erected up to the present time in reinforced concrete; this chapter contains a series of most admirably reproduced photographs of many large buildings and handsome arched bridges built entirely on this system.

The regulations which have been laid down by the Prussian Government for the employment of reinforced concrete in buildings are printed *in extenso* in appendix ii., and another appendix contains the report of the experiments carried out by the United States Geological Survey Department on the permeability of reinforced concrete pipes.

The present edition is a great improvement on previous issues, and every engineer and architect who utilises reinforced concrete on anything like a large scale in his constructional work will find this book an indispensable addition to his reference library.

T. H. B.

BOOKS ON ELEMENTARY BOTANY.

(1) *Principles of Botany.* By J. M. Bergen and B. M. Davis. Pp. ix+555. (Boston, U.S.A., and London: Ginn and Co., n.d.) Price 6*s.* 6*d.*

(2) *Introduction to Plant Ecology for the Use of Teachers and Students.* By Rev. G. Henslow. Pp. x+130. (London: E. Stanford, 1907.) Price 2*s.* 6*d.*

(3) *An Introduction to Practical Botany.* By E. H. Davies. Pp. x+127. (London: J. M. Dent and Co., 1906.) Price 2*s.*

(4) *The School Garden. A Handbook of Practical Horticulture for Schools.* By J. E. Hennesey. Pp. 155. (London: Blackie and Son, Ltd., 1906.) Price 1*s.*

(5) *Flowers Shown to the Children.* By J. E. Kelman and C. E. Smith. Pp. xii+154. (London and Edinburgh: T. C. and E. Jack, n.d.) Price 2*s.* 6*d.* net.

(1) IN the "Principles of Botany" the authors have introduced an innovation that offers definite advantages, and promises to be as suitable for practical work as for lecturing. The book is apportioned into three sections; the first comprises the morphology and physiology of the seed-plant taken in combination; classification and comparative morphology of cryptogams and phanerogams are treated in the second portion; and ecology, with a short reference to economic botany, forms the final section. As a result, only those morphological facts are noted in the first section that are required to explain the construction of the plant as a living entity, and much detail is appropriately transferred to ecology. Whilst most favourably impressed with the book in its entirety, the taxonomic portion, that more particularly demands judicious selection and

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compilation, has been ably presented by Dr. Davis. He keeps the evolutionary sequence constantly before the student, and directs special attention to the significance of alternation of generations, heterospory, and the evolution of the sporophyte. Under ecology, chapters are devoted to recent work on the origin of species and plant breeding.

The book can be confidently recommended to students and teachers, and the latter will find the arrangement well worthy of consideration.

(2) Having devoted special attention to the ecological aspect of botany, Prof. G. Henslow has prepared an introduction to the subject. The earlier pages contain a discussion of methods of teaching botany, and in subsequent chapters the nature of plant associations, modifying factors, and plant surveying are considered. The information is mainly suggestive, and will therefore be found too diffuse for the ordinary student. On the value of ecology as an educational study the author advances arguments with which one is in accord, but with regard to certain criticisms on anatomy and physiology it can only be inferred that he has not had the opportunity of observing what an excellent training is provided by a judicious laboratory course.

(3) The main object of the course planned by Mr. E. H. Davies is to enable the learner to obtain his information by his own observation, so that the lessons, except in so far as they give instructions, consist of a series of questions. The assistance required to furnish the answers is contained in a glossary at the end of the book. The detail is well thought out, and if the exercises selected are a trifle too elementary, more difficult ones can be easily substituted. The author very rightly insists on the necessity of making outline drawings of all objects examined.

(4) The advantages of a school garden where children may acquire practical knowledge are sufficiently obvious, and in country schools there should be no difficulty in securing the necessary ground. For teachers who have not the requisite horticultural experience, Mr. Hennesey provides in "The School Garden" just the information required for directing their operations. The laying out of the garden, trenching, propagation, and the cultivation of fruit trees, vegetables, and flowers are rationally and practically expounded; to these are appended suggested courses of work and general hints as to ways and means.

The book provides a concise manual of elementary horticultural instruction that may be profitably consulted, not only by teachers, but generally by those who grow their own fruit and vegetables.

(5) A coloured picture-book of flowers arranged for children, so that they can distinguish them and find out their names, describes the nature of the last book under notice. Arranged according to colour, the illustrations furnish the means of determination. The type and general form of the book are pleasing, and the short descriptions, referring mainly to the flower, are expressed in simple language.

OUR BOOK SHELF.

Ballooning as a Sport. By Major B. Baden-Powell. Pp. xx + 135. (Edinburgh and London: William Blackwood and Sons, 1907.) Price 3*s.* 6*d.* net.

Flying Machines: Past, Present, and Future. By Alfred W. Marshall and Henry Greenly. Pp. 128. (London: Percival Marshall and Co., n.d.) Price 1*s.* net.

MAJOR BADEN-POWELL himself, in a chatty introduction, describes his book as a *réchauffé* of a few magazine articles mostly written some years ago. The essays deal with the past of ballooning pure and simple, but their bright conversational style will commend them to a wide circle of readers.

The second little volume provides a popular account of flying-machines, dirigible balloons, and aëroplanes. Mathematical formulæ and calculations for designs have not been included, though the authors say they intend their information to "assist the reader with serious intention of making an attempt to produce a flying-machine, or air-ship." The book is fully illustrated, and should prove of interest to the general reader.

Principes de Géologie stratigraphique, avec Développements sur le Tertiaire parisien. By G. Courty. Pp. xiv + 78. (Paris: A. Hermann, 1907.)

THOSE who look on Lyell's "Principles of Geology" with a filial regard, and those who keep by them Dr. Marr's scientific introduction to stratigraphy, will be disappointed with the title of this little book, which deals with elements rather than with what we know in this country as principles. Prof. Stanislas Meunier contributes a preface, in which he dwells on the constantly changing character of the earth's crust; and the author also holds that his work contributes towards the realisation by the reader of this "vitalité tellurique." But we are given little else than a summary of what is to be found in an ordinary text-book, and no attempt is made at generalisation. For a French work this is remarkably void of inspiration.

Outlines of Practical Sanitation. By Dr. H. B. Bashore. Pp. vi + 208. (New York: J. Wiley and Sons; London: Chapman and Hall, 1906.) Price 5*s.* 6*d.* net.

THE scientific principles of public health and personal hygiene are explained in a simple and attractive style in this volume. Though the author refers particularly to conditions in rural and urban districts of the United States, his descriptions are concerned in the main with considerations of causes affecting health in general, both of the community and the individual. Familiarity with the principles described ought to be regarded as an essential qualification of every member of a sanitary committee of a public body. The book should be found useful as a means of imparting sound ideas of the laws of healthy living to teachers and citizens.

Essay on the Creative Imagination. By Th. Ribot Translated from the French by Albert H. N. Baron. Pp. xix + 370. (Chicago: The Open Court Publishing Co.; London: Kegan Paul, Trench, Trübner and Co., Ltd., 1906.)

THE translator, enumerating some of his reasons for translating M. Ribot's essay, summarises the results at which it arrives by stating the author has shown clearly that "imagination is a function of mind common to all men in some degree," and that it is as highly developed in "practical inventors as in the most bizarre of romantic idealists." The chapter on the scientific imagination will appeal especially to the student of science.

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